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AUTHOR Evans, Diane
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ABSTRACT

This teacher-prepared Learning Activity Package (LAP) for individualized instruction in topics in pre-algebra covers the natural numbers, whole numbers, and integers. The unit contains a rationale for the material, a list of behavioral objectives, a list of resources including texts (with reading assignments and problem sets specified) and tape recordings, a problem set for student self-evaluation, suggestions for advanced study, and references. (DT)

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NATURAL NUMBERS, WHOLE NUMBERS, AND INTEGERS

Ninety Six High School
Ninety Six, S.C.

Pre-Algebra

REVIEWED BY

LAP NUMBER 7

WRITTEN BY Diane Evans

SE 018 189

RATIONALE (The LAP's Purpose)

You have previously studied both the natural numbers and the whole numbers. For many centuries these were the only numbers man needed. But as time passed and civilizations grew more advanced and sophisticated, men found these numbers were not enough. They needed numbers to represent losses, below zero degree temperatures, and other such situations. To solve this problem, the set of integers were invented. In this LAP you will study the set of integers and operations using integers. You will also study the properties of integers and absolute values.

SECTION I

Behavioral Objectives

At the completion of your prescribed course of study, you will be able to:

1. Identify and/or write a definition for the sets of natural numbers, whole numbers, and/or integers.

2. Given a statement in words, write and/or identify an integer which represents it.

3. Determine if each of the eleven previously studied properties hold for the sets of natural numbers, whole numbers, and/or integers.

4. Compare which properties hold for the set of integers that do not hold for the natural numbers and/or the whole numbers.

5. Draw and/or identify a number line to represent the sets of natural numbers, whole numbers, and/or integers.

6. Given any two integers, write a comparison using > or < and/or determine if such a comparison is true or false.

RESOURCES

Objectives 1, 2

Dolciani, read pages 111-112, 170, Ex. 1-28 even page 113.
Wollensak C-3458 The Real Number System

Objectives 3, 4

* Appendix I, II
Dolciani, read pages 71-72, Ex. Appendices I, II.
Nichols, read pages 34-44, Ex. Appendices I, II.
Wollensak Tapes C-3453: The Commutative Property
C-3454: The Associative Property
C-3456: The Closure Property
C-3457: The Inverse Elements
C-3459: The Identity Element

Objective 5

Vanatta; read page 81, Ex. 3 page 83.

Objective 6

Dolciani, read page 114, Ex. 1-12 oral page 114.

* required (turn in to teacher)

SELF-EVALUATION 1

Obj.
1 I. Define:

a) natural numbers

b) whole numbers

c) integers

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2 II. Write an integer to represent each of the following:

_____ 1. ten degrees below zero

_____ 2. 40 feet above sea level

_____ 3. a loss of $90

_____ 4. 15 yards gain in a football game

_____ 5. sea level

3 III. Put a cross (X) beside the properties that hold for the natural numbers. Put a circle (O) beside the ones that hold for the whole numbers. And put a (✓) beside the ones that hold for the integers.

_____ 1. closure +

_____ 2. closure X

_____ 3. com. +

_____ 4. com. X

_____ 5. asso. +

_____ 6. asso. X

_____ 7. dist.

_____ 8. ad. id.

_____ 9. ad. inv.

_____ 10. mul. id.

_____ 11. mul. inv.

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4 IV. Put a circle (O) around the number(s) of the properties that hold for integers but not for natural numbers. Put a cross (X) on the number(s) of the properties that hold for integers but not for the whole numbers.

1. closure +
2. closure X
3. com. +
4. com. X
5. asso. +
6. asso. X
7. ad. id.
8. ad. inv.
9. mul. id.
10. mul. inv.
11. dist.

5 V. Draw a number line to illustrate:

a. natural numbers

b. whole numbers

c. integers

6 VI. Put either > or < to make these true.

1) -6 ___ +3
2) -3 ___ -4
3) -10 ___ 0
4) -1 ___ +1
5) +2 ___ +1
6) -.1 ___ -.2
7) -10 ___ +10
8) 0 ___ -7
9) +5 ___ -5
10) -8 ___ -10

If you have satisfactorily completed your work, take the Progress Test. Consult your teacher first.

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SECTION 2

Behavioral Objectives

After having completed your prescribed course of study, you will be able to:

7. Given any integer, write and/or identify its absolute value.

8. Given any statement of relations between two absolute values, determine if it is true or false.

9. Evaluate expressions involving absolute values.

10. Given two or more integers, write and/or identify their

    a. sum
    b. difference
    c. product
    d. quotient

RESOURCES

Objective 7

Vanatta, read pp. 88-89, Ex. 2 page 89.

Objective 8

Dolciani, read p. 123, Ex. 1-12 page 124.
Nichols, read p. 61. Ex. 1 page 62.

Objective 9

Dolciani, Ex. 13-16, 21, 23, 24 page 124.
Vanatta, read pages 88-89, Ex. 3 page 90.

Objective 10

A. Dolciani, read pp. 124-125. Ex.: page 126 orals 1, 2, 3, 4, 6, 7, 8, 9, 11, 12, 15, 16.
Vanatta, read pp. 90, 95. Ex.: page 95 nos. 1, 2, 3, 4, 5, 8, 9, 10, 11, 17, 18, 19, 20, 21; page 96 nos. 1-6, 10, 12-19.

B. Dolciani, read pp. 128-130. Ex.: page 130 orals 1-16, 17-25; page 131 nos. 1-4.
Nichols, Ex.: page 89 no. 3 (all parts).
Vanatta, read pp. 96-99. Ex.: page 99 nos. 1-6, 9-14; page 100 nos. 1-11 (top of page); page 100 (bottom) nos. 1-10.

C. Nichols, Ex.: 1 page 95.
Vanatta, read pp. 101-103, Ex: 1-14, 17-26, page 104.

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Resources (cont')

D. Dolciani, read pp. 138-140. Ex.: page 140 nos. 1-20.
Nichols, read pp. 96-98. Ex.: pages 98-99 nos. 1 a-p, 2 a-f.
Vanatta, read pp. 104-107. Ex.: page 106 nos. 1-14.
Wollensak Tapes C-3331 Directed Numbers: Addition
C-3332 Directed Numbers: Subtraction
C-3333 Directed Numbers: Multiplication
C-3334 Directed Numbers: Division

Filmstrips:
Comparing Fractions: Adding and Subtraction
Multiplying Fractions
Multiplication of Signed Numbers
Dividing Fractions

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Obj.
7 I. Give the absolute value for each of the following:

_____ 1. $|-8|$

_____ 2. $|0|$

_____ 3. $|-15|$

_____ 4. $|13|$

_____ 5. $|20|$

_____ 6. $|-4|$

_____ 7. $|6 - 1|$

_____ 8. $|8 - 9|$

_____ 9. $|10 - 30|$

_____ 10. $|8 - 8|$

8 II. Write True or False for each of these.

_____ 1. $|10| = 10$

_____ 2. $|-1| = -1$

_____ 3. $|8| = |-8|$

_____ 4. $|-27| < |19|$

_____ 5. $|0| < |-6|$

_____ 6. $|-7| > |-8|$

_____ 7. $|10| = -10$

_____ 8. $|0| > |-8|$

_____ 9. $|32| > |-50|$

_____ 10. $|-27| = 27$

9 III. Perform the indicated operations.

_____ 1. $|3| + |5|$

_____ 2. $|-2| - |-1|$

_____ 3. $|6 + 7|$

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_____ 4. |-5| - |2|

_____ 5. |-5| - |-2|

_____ 6. |-6| + |-9|

_____ 7. |-8| - |-9|

_____ 8. |0| - |-3|

_____ 9. -|7| - |4|

_____ 10. |-9| -|6|

10A IV. Add the following integers.

1) -8 2) +9 3) -7 4) +7 5) +6 6) +12
-8 +7 +4 +16 +7 -15
-2 -8 +16

7) (-8)+(3)+(14)+(-6) = _____

8) (-9) + (-6) + (-2) + (8) = _____

9) (-11) + (10) + (-3) + (1) = _____

10) (-1) + (3) + (-2) + (4) = _____

10B V. Find the differences of the following:

1) +12 (2) -6 (3) -5 (4) +12 (5) -4 (6) +6
+7 -8 +16 -7 -9 +8

(7) 8 - 5 = _____

(8) -3 - 6 = _____

(9) +7 - 9 = _____

(10) -12 - 11 = _____

10C VI. Multiply the following:

(1) -3 (2) -6 (3) -7 (4) +6 (5) -6 x -4 = (6) +4 x -7 =
+4 -4 +2 +4

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(7) (-5)(+7) = _____

(8) (-6)(-9) = _____

(9) (-2)(+4)(-1)(+5) = _____

(10) (-3)(-2)(-1)(-4) = _____

10D VII. Find the following quotients:

(1) -6 ÷ -2 = _____

(2) -30 ÷ +10 = _____

(3) +14 ÷ -7 = _____

(4) +28 ÷ + 4 = _____

(5) +20 ÷ - 10 = _____

(6) $\frac{-10}{-2}$ = _____

(7) $\frac{+20}{-5}$ = _____

(8) +12 ÷ -3 = _____

(9) $\frac{-16}{+4}$ = _____

(10) $\frac{+8}{+2}$ = _____

If you have satisfactorily completed your work, take the LAP TEST. CONSULT YOUR TEACHER FIRST.

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APPENDIX I

Put an X by each property that holds for the given sets of numbers. Put a circle (O) by each property that does not hold. Do not leave a blank.

PROPERTY	NATURALS	WHOLES	INTEGERS
Closure for +			
Closure for X			
Commutative +			
Commutative X			
Associative +			
Associative X			
Distributive			
Add. Identity			
Mult. Identity			
Add. Inverses			
Mult. Inverses			

APPENDIX II

1. What properties hold for the whole numbers that do not hold for the natural numbers?

2. What properties hold for the integers that do not hold for the naturals?

3. What properties hold for the integers that do not hold for the whole numbers?

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ADVANCED STUDY

1. a. Prepare a chart showing the relationship among the three sets we have studied: natural numbers, whole numbers, and integers.

   b. Prepare a table comparing the properties which hold for the three sets we have studied.

2. Write a report on the origin of the word integer and state when it was first used.

3. Prepare a bulletin board showing how integers are used in our lives today.

4. Prove $-(a - b) = -a + b$.

   (Hint: $(a - b)$ is the additive inverse of $-(a - b)$)

5. Work the Extra for Experts in Dolciani p. 152 and hand it in.

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Dolciani, Mary P., Berman, Simon L., Freilich, Julius, Modern Algebra, Book 1, Houghton Mifflin Co., 1965.

Vanatta (abbreviation)

Vanatta, Glen D., Goodwin, A. Wilson, Algebra One, Charles E. Merrill Publishing Co., 1966.

Wollensak Teaching Tape - C-3458 The Real Number System
C-3453 The Commutative Property
C-3454 The Associative Property
C-3456 The Closure Property
C-3457 The Inverse Elements
C-3801 Open Phrase, Open Sentence
C-3459 The Indentity Element
C-3331 Directed Numbers: Addition
C-3332 Directed Numbers: Subtraction
C-3333 Directed Numbers: Multiplication
C-3334 Directed Numbers: Division